**REMARKS**

Initially, applicant would like to thank Examiner Repko for the helpful and courteous telephonic interview he conducted with one of applicant's representatives on March 8, 2006, in conjunction with the present application and the Office Action of January 26, 2006. During the interview, arguments on the distinctions and advantages of the invention were discussed. However, no specific agreement was reached.

Upon entry of the present Amendment-B, the claims in the application are claims 1-12, of which claims 1, 3, 6, 7, 9 and 10 are independent.

The above-identified Office Action has been reviewed, the applied references carefully considered, and the Examiner's comments carefully weighed. In view thereof, the present Amendment-B is submitted. It is contended that by the present amendment, all bases of rejection set forth in the Office Action have been traversed and overcome. Accordingly, reconsideration and withdrawal of the rejection is respectfully requested.

In the above amendments: each of claims 6 and 10 have been amended by expressly defining that a program is <u>embodied on a computer readable medium</u> for compositing a computer-graphics image and a picture taken by a camera; and by changing claim language from "the program capable of causing a computer to perform steps--" to "the program causing a computer to perform the steps --".

Paragraph [039] of the specification has been amended to expressly discuss the present invention as represented by Fig. 7 of the disclosure.

Applicant respectfully submits that the above amendments are fully supported by the original disclosure including drawings, and that no new matter is introduced into the application by the above amendments.

**Drawings**

1. At item 1 of the Office Action, the Examiner indicates that Figures 5 and 6 should be designated by a legend such as – Prior Art – because only that old is illustrated in these drawings.

*Applicant's response:*

In view of the above amendments to the Figures 5 and 6, applicant respectfully submits that the objection is overcome, and requests reconsideration and withdrawal of same.

2. At item 2 of the Office Action, the Examiner objected to the Fig. 7 as failing to comply with 37 CFR 1.84 (p) (5) because it includes the characters r2' and r3', which are not mentioned in the written description of the present application.

*Applicant's response:*

In view of the above amendments to the specification, applicant respectfully submits that the objection is overcome, and requests reconsideration and withdrawal of same.

**Claim Rejections – 35 USC §101**

At item 5 of the Office Action, the Examiner rejected claims 6 and 10-12 under 35 USC §101. In his rejection, the Examiner states that the claims 6 and 10-12 are directed to a non-statutory subject matter; and that these claims recite a computer program, which is not technologically embodied.

*Applicant's Response:*

Upon careful consideration and in light of the above amendments, applicant respectfully traverses such rejections of claims 6 and 10-12, and submits that the subject matter of each of these claims has utility which is detailed in the disclosure of the present invention.

For example, claim 6 defines that "a program causing a computer to perform the recited steps -- for generating a composite image", which expressly indicates utility of the claimed invention.

Further, paragraph [025] of the specification, clearly demonstrates utility and applications of the claimed invention, which reads as "In yet another exemplified aspect of the present invention, there is provided a program for rendering a 3D model created by CG into a 2D image to be superposed on a picture taken by a camera to form a composite image."

Based on the foregoing discussion, applicant respectfully asserts that the claimed invention does not simply perform mathematical or logical calculations but accomplishes "practical application", and produces a "useful, concrete and tangible result", as specified in MPEP §2106, for formation of composite images using a computer program and an image from a real world camera.

Thus, the Examiner fails to provide a reasonable basis to support prima facie rejection of claims 6 and 10-12 based on lack of utility under 35 USC §101, i.e., the Examiner did not provide a reasonable basis to support his conclusion that the present application describes an invention that is nonuseful, inoperative, or contradicts known scientific principles.

Moreover, in order to expedite the prosecution of the application, each of independent claims 6 and 10 has been amended by expressly defining that a program is embodied on a computer readable medium for compositing a computer-graphics image and a picture taken by a camera; and by modifying claim language from "the program capable of causing a computer to perform steps --" to "the program causing a computer to perform the steps --".

For all of the foregoing reasons, applicant requests reconsideration and withdrawal of the rejection of claims 6 and 10-12 under 35 USC § 101.

**Claim Rejections – 35 USC §103**

1. At item 8 of the Office Action (page 4), the Examiner rejected claims 1, 6, 7 and 10 under 35 USC §103 (a) as being unpatentable over Noyama et al. (US 5,594,850) in view of Kolb et al. (US 6,028,606).

*Applicant's response:*

Upon careful consideration, applicant respectfully traverses such rejections of claims 1, 6, 7 and 10 because the proposed modification of Noyama et al.'s image simulation method by applying a select feature of Kolb et al.'s method of rendering a synthetic two dimensional image from a three dimensional scene is improperly based on a suggestion coming entirely from the Examiner (guided by impressible hind sight of applicant's disclosure), rather than from any teaching or suggestion which may be fairly gleaned from the references themselves; and because the references, either considered singly or in combination, do not otherwise disclose or suggest features of the claimed invention.

For example, Noyama et al. disclose a method of image simulation for creating a composite image by combining a computer graphics (CG) image 20, formed from a three-dimensional CG model 10 consisting of an object shape model 12, and a natural image 30. The method of Noyama et al. generally includes: segmenting the CG image 20 for creating a mask image 22; defining a mask attribute table 33 for the mask image by data transformation; creating an intrinsic image 28 (consisting only of the pixel values needed for the region to be color transformed) by data transformation; cutting a portion from the CG image using the mask image; and combing the cut portion of CG image with the natural image 30 for forming a composite image (col. 4 line 31 – col. 5, line 7, Fig. 1, and col. 7, lines 1-2).

The procedure for creating the mask image, according to Noyama et al., includes projecting a three-dimensional object shape model 12 onto a projection plane 240 thereby forming a two-dimensional CG image corresponding to a shadow of the shape model 12 on the plane 240; assigning different mask ID numbers to pixel of a projected image region 250 and to exterior region 260 thereof. Also, Noyama et al. disclose that, the mask image 22 does not have the details of the CG image 20 relating to color or pixel intensity but is merely divided or segmented into regions with the regions being masks respectively identified with mask ID numbers so that the masks may be used later in producing the composite image by the simulation (col. 7, lines 34-40). Thus, for forming mask image, ray tracing starts from an eye 16 and continues along a straight line connecting the eye 16 and the pixel being processed on the projection plane until striking the shape object 12, and then check is made as to whether the object struck is the light source 14 (col. 7, line 66 – col. 8, line 3).

Further, Noyama et al. disclose that the natural image 30 consists solely of color information for each pixel, and *a human operator carries out prearranged processing for cutting out the object* (i.e., a tree 66) from the natural image 30 (consisting of the tree and background), creating a mask image 32 (only the tree, no background) from the natural image 30, and manually fills in a mask attribute table 33 for the cutout object. Noyama et al. assert that, a CG image 20 – created with computer graphics (data gathering) along with simultaneous automatic generation of transformation data for later image simulation (simulating) – is compatible with the pixel color data in the natural image 30, and therefore, it is possible to immediately create a composite image 50 by combining the CG image 20 (or more accurately the transformation data) and the natural image 30 (or more accurately the mask image 32 of the natural image 30) in the simulation section 300. In addition to such combination, as Noyama et al. assert, the intrinsic

image 28 can be utilized for conducting color change as another type of image simulation (col. 9, lines 27-45, Figs. 1 and 6).

With reference to the disclosure of Kolb et al., applicant notes that, Kolb et al. disclose a computer graphic method – which is essentially depends on camera specifications of a specified physical camera – for synthesizing a two-dimensional image from data representing a radiant three-dimensional scene image. The computer graphics method of Kolb et al., for synthesizing a two-dimensional image, includes the steps of: (a) computing an exit pupil of a lens system 56; (b) selecting a ray that passes through the exit pupil to an image point on an image plane; (c) tracing the ray from the three dimensional scene through the lens system to the image point; (d) calculating a radiance value for the ray (wherein the calculation of the radiance value for the ray in step (d) comprises setting the radiance value to zero if the ray is vignetted); (e) repeating steps (b)-(d) to obtain a plurality of radiance values; and (f) combining the plurality of radiance values to generate the two dimensional image on the image plane (col. 4, lines 2-22, Fig. 1).

Also, applicant notes that, the method of Kolb et al. is dependent on *specifications of a physical camera*, i.e., dimensions and indices of refraction of lenses, stops, shutter characteristics, location of film surface relative to lens system, orientation of camera within scene, etc., and therefore, in their method a three-dimensional model can not be properly synthesized into a two-dimensional image *unless all required specification of a physical camera* (may be also calibration charts) are available.

In view of the above analysis, although Noyama et al. disclose a three-dimensional model, a view point and a plane of projection for ray tracing of a three-dimensional CG model 12 to form two-dimensional mask images 22, 250, 260, they fail to disclose defining lines of sight extending from the viewpoint to projection pixels on the plane of projection so that each of

the lines of sight conforms with a ray of light incident on a pixel corresponding thereto of the picture taken by the camera, as required by claim 1, because as discussed above, in their system an object 66 is manually cut out from the natural image 30 and a mask image 32 is created thereof, and a mask attribute table 33 is *manually* filled for combining the cut out portion of the natural image with the CG image.

Further, Noyama et al. fail to disclose the method step of superposing the two-dimensional image (formed from the three-dimensional model) on the picture taken by camera to generate a composite image, as required by claim 1, because in their method, the cut out portion of natural image is superposed on mask image, i.e., a segmented portion, of the two-dimensional CG image, which teaches away from the claimed invention. Moreover, Noyama et al. disclose that only the cut out portion, not the entire portion, of the natural image is combined with the CG image, which teaches away from the claimed invention, because in the claimed invention, two-dimensional image is entirely superposed on the entire picture taken by camera for forming a composite image.

Furthermore, although Kolb et al. disclose a method for synthesizing a two-dimensional image from data representing a radiant three-dimensional scene image, they fail to teach or suggest anything related to superposing the two-dimensional image on the picture to generate a composite image, as required by claim 1.

Also, Kolb et al. fail to disclose the method of defining lines of sight extending from the viewpoint to projection pixels on the plane of projection so that each of the lines of sight conforms with a ray of light incident on a pixel corresponding thereto of the picture taken by the camera, as required by claim 1, because in their method a two-dimensional image is synthesized from a three-dimensional scene image and the two-dimensional image is not related to any other

picture or image.

A person of ordinary skill in the art would not consider the hypothetical modification of Noyama et al. based on a select teaching of Kolb et al., as proposed by the Examiner, to be obvious because the actual disclosures of these references provide no motivation for such modification. For example, Kolb et al. teach a camera simulation method based on characteristics of the physical camera, e.g., indices of refraction of lenses, stops, location of film surface relative to lens system, etc., but this has no applications to Noyama et al.'s invention because Noyama et al.'s system does not require such characteristics of the physical camera for forming a composite image. The reason that Kolb et al. include such features simply does not apply to the system of Noyama et al.

On the other hand, even hypothetically combining teachings of these references would not achieve the claimed invention for several reasons. For example, if the image simulation method of Noyama et al. is combined with the camera simulation method of Kolb et al., the resulting method will allow rendering a synthetic two-dimensional image of a three-dimensional model 12, based on specifications of a physical camera used to produce the three-dimensional model. This combination destroys invention of Noyama et al. because their method requires formation of mask images, i.e. segmenting CG image, for receiving a cut out portion of the natural image.

Still further, any hypothetical combination of methods of Noyama et al. and Kolb et al. fails to teach or suggest a method step of defining lines of sight extending from the viewpoint to projection pixels on the plane of projection so that each of the lines of sight conforms with a ray of light incident on a pixel corresponding thereto of the picture taken by the camera, as required by claim 1, because neither of the references teaches this aspect of the claimed invention.

Moreover, the claimed invention is advantageous over the applied references because for forming a composite image according to the claimed invention does not require manual cutting of portion or portions of camera image and manually creating an attribute table therefore, as required by Noyama et al.; and the claimed invention is not dependent on the specification of a physical camera, for forming a two dimensional CG image, as required Kolb et al.

Thus, applicant respectfully submits that the Examiner fails to establish prima facie obviousness for rejection of claim 1 and therefore, this claim is believed to be patentably distinct over the applied reference.

Further, the Examiner fails to establish prima facie obviousness for rejection of claims 6, 7, and 10 for the reasons provided in relation to claim 1. Thus, these claims are also believed to be patentably distinct over the applied references.

For all of the foregoing reasons, applicant requests reconsideration and withdrawal of the rejection of claims 1, 6, 7 and 10 under 35 USC § 103(a).

2. At item 18 of the Office Action (page 8), the Examiner rejected claims 2-4, 8, 9, 11 and 12 under 35 USC 103 (a) as being unpatentable over Noyama et al. in view of Kolb et al. and in further view of Benjamin Mora, Jean Pierre Jassel, René Caubet (A New Object-Order Ray-Casting Algorithm, October 27, 2002: Proceedings of the Conference on Visualization 2002).

*Applicant's response:*

Upon careful consideration, applicant respectfully traverses such rejections claims 2-4, 8, 9, 11 and 12 for the reasons provided in relation to claim 1 which are not overcome by additional teachings of Mora et al., and for the reasons given below.

For example, Mora et al. teach, as discussed at Sections 3.1 and 3.2 of their disclosure, an object-order ray-casting technique for rendering an image having table associated with pixel index, ray index and ray parameter (i.e., coordinates (x, y, z and length), wherein few cells of the table include precomputed ray parameters, and the set of rays is reconstructed every time viewpoint changes by sampling a square surrounding template hexagon.

However, Mora et al. fail to disclose or suggest a calibration table having first data and second data correlated with each other, as required by each of claims 2 and 8. Therefore, these claims are believed to be patentably distinct over the applied references considered either singly or in combination.

Also, claims 3, 4, 9, 11 and 12 are believed to be patentably distinct over the applied references for the reasons provided in relation to claims 1, 2 and 8.

For all of the foregoing reasons, applicant requests reconsideration and withdrawal of the rejection of claims 2-4, 8, 9, 11 and 12 under 35 USC 103 (a).

3. At item 30 of the Office Action (page 12), the Examiner rejected claim 5 under 35 USC 103 (a) as being unpatentable over Noyama et al. in view of Kolb et al. and in further view Mora et al. and in further view of F.S. Hill, Jr. (Computer Graphics Using Open GL, May 15, 2000, 2nd Edition, Prentice Hall).

*Applicant's response:*

Upon careful consideration, applicant respectfully traverses such rejections claims 5 for the reasons provided in relation to claim 3 which are not overcome by additional teachings of Hill, Jr., and for the reasons given below.

For example, the disclosure of Hill, Jr. (a portion of Chapter 4 of the applied reference) is from non-analogous art and teaches a general review of vector arithmetic, which is a subject matter of a standard textbook, and do not suggest or teach that one piece of second data of the calibration table includes coordinates of two points on the incident light, as required by claim 5. Therefore, claim 5 is believed to be patentably distinct over the applied references considered either singly or in combination.

For all of the foregoing reasons, applicant requests reconsideration and withdrawal of the rejection of claim 5 under 35 USC 103 (a).

Other Matters

The additional reference cited by the Examiner on the form PTO-892 included with the Office Action – US patent 6,268,863 to Rioux has been considered by applicant. However, applicant respectfully submits that the additional reference fails to overcome the deficiencies of the applied reference, as discussed in relation to the present claims hereinabove.

## **Conclusion**

In conclusion, applicant has overcome the Examiner's objection and rejections as presented in the Office Action; and moreover, applicant has considered all of the references of record, and it is respectfully submitted that the invention as defined by each of present claims 1-12 is patentably distinct thereover.

Applicant respectfully submits that all of the above amendments are fully supported by the original application. Applicant also respectfully submits that the above amendments do not introduce any new matter into the application.

The application is now believed to be in condition for allowance, and a notice to this effect is earnestly solicited.

If the Examiner is not fully convinced of all of the claims now in the application, applicant respectfully requests that he telephonically contact applicant's undersigned representative to expeditiously resolve prosecution of the application.

Favorable reconsideration is respectfully requested.

Respectfully submitted,

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